Urethral Stenosis in Young Girls

A Cause of Recurrent Infection of the Urinary Tract

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•Recurrent urinary tract infection in young girls may result from unsuspected urethral stenosis.

The diagnosis should be considered in the presence of symptoms suggesting obstruction of the lower urinary tract—symptoms such as infrequent voiding and straining on urination, particularly in intervals between bouts of acute febrile illness accompanied by pyuria or bacilluria. If radiopaque medium is retained in the bladder in unusual quantity following voiding at the close of excretory urography, it is suggestive but not pathognomonic of urethral stenosis. The diagnosis is established by instrumental calibration of the urethra under general anesthesia.

Treatment consists in removing the cause by urethral dilatation and administering antibiotics and chemotherapeutic agents to overcome the infection.

THE DISTRESSING PROBLEM of recurrent infection of the urinary tract in young girls is frequently encountered by general practitioners, pediatricians and urologists. The condition is most disturbing to parents forced to cope with recurrent and unpredictable severe febrile illness, and the patients, in addition to the physical effects of recurring acute infection, may suffer emotionally and may be retarded in their development. Too often an anxious parent sequesters a child so affected, treating her as a semi-invalid unable to enjoy fully the experience of growing up.

The authors believe that urethral stricture deserves emphasis as a cause of recurrent urinary infection in young girls. All physicians are familiar with stricture of the urethra in adult males with the attendant sequelae of urinary tract obstruction, stasis and infection, even to the point of decompensation of the ureterovesical valve mechanism, of which the end result may be dilatation and stasis of the upper urinary tract with ultimate renal failure.[4] The same situation may occur in male infants and may result from stenosis of the preputial meatus, the urethral meatus, the urethra or valves of the posterior urethra or from congenital contracture of the vesical neck.[3] Although urinary tract infection occurs less frequently in young boys than in girls, the presence of an obstructive lesion as a cause is more likely to be recognized early in boys simply because the known higher incidence of such lesions in males often leads to urologic investigation without delay.

Urethral stenosis in girls is by no means a new or heretofore unrecognized entity. Campbell[1] reported a series of 152 cases which he had observed of urethral stricture in children varying in age from 7 weeks to 16 years, 26 of which were in girls. Two of the girls, aged 13 and 30 months, were examined because of so-called "chronic pyelitis." Each was found to have tight congenital stenosis of the external urinary meatus with trabeculation and sacculation of the urinary bladder. The bladder of each, Campbell noted, had the same appearance as that seen in long-standing chronic prostatic obstruction in elderly males. In another girl of 3 years he found by cystographic evidence that dilatation of the upper urinary tract had resulted from stenosis of the urethral meatus.

It is reasonable to assume that most infections of the urinary tract in young girls originate in the lower tract. In infants they probably originate as "diaper infections." If there is no mechanical obstruction of the lower tract, infection of this type is transient; and even before the advent of chemotherapeutic and antibiotic agents, the simple expedient of copious fluid intake ultimately was curative.

During the past few years the authors have observed several young girls with urinary infections, most of whom were brought to a physician because of recurrent acute illness of sudden onset, and in most cases without symptoms directly referable to the urinary tract during the febrile periods. The majority of them had pyuria and bacteruria, varying in degree from case to case. In each was found subjective and objective evidence that the urethra was abnormally

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small. None of these children, however, had evidence of severe obstructive changes in any of the urinary organs. In several the nature of the repeated febrile illnesses had not been determined in earlier occurrences simply because the urine had not been carefully examined.

The following cases have been selected as illustrative of the clinical manifestations:

CASE REPORTS

CASE 1: A 4½-year-old girl had had recurring fever, 104° to 106° F., since the age of 9 months, associated regularly with vomiting and on one occasion with generalized convulsions. These febrile periods recurred regularly in approximately four-month cycles and lasted about a week. From the age of about 2½ years the child had voided very infrequently, never more often than twice in 24 hours and always in large quantity, although there was no difficulty in starting the stream. She had always been frail and relatively inactive, had frequent colds, and, it was reported, had had bronchopneumonia three or four times. She was small and slender; her height and weight were approximately two standard deviations below the mean for her age. No other abnormalities were noted on physical examination. The only abnormalities observed in laboratry studies were the following: In a stained smear of a urine specimen obtained by catheter many pus cells, some clumped, with many granular and cellular casts and Gram-negative rods, were seen; Proteus vulgaris grew on a culture of the urine. Minimal blunting of the minor calyces of the right kidney was observed in an excretory urogram, and some residual urine was noted in the bladder in a film made after voiding.

With the patient under general anesthesia the urethra barely permitted passage of a size 14 (French) sound. On cystoscopy early trabeculation of the bladder with elevation of the interureteric ridge and injection of the trigone was noted, but no abnormalities were found in the upper tract. The urethra was dilated with some difficulty to size 18 (French). The urinary infection was thereafter treated with sulfacetimide.

After the dilatation procedure the urine remained clear and for the first two months the patient voided easily, about five times daily. Three months after dilatation, although feeling well, she was voiding only three times daily and complained of slight dysuria. She was again hospitalized and the urethra was dilated to size 20 (French). Urine drawn by catheter was still clear. Six months after the original dilatation the patient remained afebrile and symptom-free.

CASE 2: An 11-year-old girl had urinary frequency and incontinence of pronounced degree for two days. She gave a history of incontinence on laughing or during active play from infancy. She voided only at long intervals and seemed unable to void unless the bladder was quite full. No abnormalities were observed on physical examination. On urinalysis proteinuria of more than 0.1 gm. per 100 cc. was noted and many erythrocytes, pus cells, round epithelial cells and motile rods were seen. Cultures of urine from the bladder contained E. coli. No abnormality was observed in excretory urograms. On cystoscopy the urethral meatus was found to be narrow, red and edematous. There were moderate trigonitis and cystitis. In excretory urograms the upper urinary tract appeared normal. The urethra was dilated to size 24 (French) and a mixture of terramycin and chloramphenicol was given for one week. Thereafter for eight months, during which she was observed occasionally, the patient had no incontinence or other symptoms. No abnormalities were noted in examination of the urine and no organisms grew on cultures.

CASE 3: A 3½-year-old girl had repeated bouts of high fever, lethargy and pyuria for one year. No cause had been found on physical examination on these occasions, but the condition had responded satisfactorily to sulfonamide therapy. There had also been many intercurrent episodes of infection of the respiratory tract and of adenotonsillitis and otitis media. The urinary symptoms frequently followed respiratory tract disease. The urine sediment was usually found to contain many pus cells with clumps of leukocytes and a few granular casts. Aerobacter aerogenes grew on a culture of urine. No abnormalities were noted in excretory urograms. With the patient under general anesthesia, a cystoscope, size 16 (French), was introduced with some difficulty owing to urethral stenosis. The interureteric ridge was somewhat elevated and the trigone and urethra were diffusely reddened. The upper tract was normal. In nine months of observation thereafter the patient was well except for two bouts of fever and pyuria, one associated with vulvovaginitis due to Enterobius vermicularis and the other with adenotonsillitis.

CASE 4: The patient's mother noted that her daughter, aged 3½ months, had to push and strain a good deal to void. On examination of the urine a slight increase in pus cells was noted and there were some motile rods in the urinary sediment. The symptoms subsided spontaneously in three to four days and did not recur for more than a year, but the patient ate little and grew slowly. At the age of 20 months she had been voiding infrequently for two to three weeks, and then only with what seemed to be a painful effort in starting the stream. The small size of the urethral meatus was the only abnormality observed on physical examination at that time. The patient was hospitalized and, in a specimen of urine obtained by catheter, pus cells, a few erythrocytes and a few motile rods were noted. No organisms grew on a culture of the urine. The patient was anesthetized and the urethral meatus was dilated without difficulty to size 18 (French). On cystoscopic examination the right ureteral orifice was observed to lie almost directly in the posterior midline.

During the six months following dilatation the patient was well, voiding frequently and easily and having no symptoms of urinary disorder. At the age of 26 months she began to have difficulty in starting the urinary stream, and for a time voided quite infrequently. In a specimen of urine obtained by catheter the sediment was found to be normal, but E. coli were recovered from a culture. At 30 months, although there were no urinary difficulties, the gain in weight had been poor. Again a specimen of urine was obtained by catheter; it contained a few large clumps of pus cells, but there was no growth on a culture. Six weeks later the difficulty in starting the urinary stream recurred, and the patient was voiding only twice a day. This condition continued for about a month, although specimens of urine were normal. Further dilatation of the urethra was being considered when the condition improved spontaneously. During the following six months the patient remained in good health and free of symptoms.

CASE 5: A 32-month-old girl had four bouts of fever in a period of five months, the first following adenotonsillitis. For six weeks she had been anoretic and restless, fatigued and irritable, had complained of abdominal pains from time to time, and urinated infrequently, as seldom as once a day. Previously she had been very active and had urinated four or five times daily. She seemed normal on physical examination except that she was slender and frail in appearance.

A specimen of urine obtained by catheter contained a moderate number of pus cells, a few in clumps, and Gram-positive cocci were present in a smear. The infection cleared after a week's treatment with sulfonamides but the patient continued to void infrequently. No abnormality was noted in excretory urograms. With the patient under anesthesia, a sound of size 14 (French) was introduced but difficulty was encountered in passing it. After further dilatation, cystoscopy was done, but no abnormality observed except for some elevation of the interureteric ridge. In excretory urograms the upper urinary tract appeared normal. The patient had no urinary symptoms and urinated normally during six months of observation after dilatation was carried out.

CASE 6: A one-year-old girl voided urine infrequently and with some distress. At the age of 28 months, and intermittently during the next two months, she urinated as infrequently as once in 24 hours and complained of pain on doing so. On one occasion catheterization was necessary to relieve acute retention of urine. Neither pyuria nor bacteruria was noted in microscopic examination. In excretory urograms the bladder was observed to be grossly distended, and the opaque medium was almost completely retained in the distended bladder after urination. The patient was anesthetized and sounds were introduced; the urethra was found to be very narrow and tight, but no abnormality was seen in cystoscopy. The urethra was dilated gradually to size 22 (French). In two years of observation after the dilatation procedure there were no urinary difficulties.

CASE 7: After having rubella a girl aged 18 months urinated only two or three times a day, and then only by straining. She appeared normal on physical examination except for being small and slender. The bladder and kidneys were not palpable. Pus cells and a trace of albumin were found in the urine. Cocci were seen in a direct smear on one occasion, but no organisms grew on cultures. The patient was anesthetized and the urethral meatus, which was stenotic, was dilated. In cystoscopy the poster wall and dome of the bladder were seen to be trabeculated, and the internal vesical sphincter appeared to be hypertrophic. No abnormality in the upper tract was observed in retrograde pyelographic examination. For two and one-half months after the dilatation procedure the patient voided no more frequently than two or three times a day, but without pain or effort, and in the subsequent fourteen months she had no urinary symptoms.

ETIOLOGY

Urethral stenosis may be either congenital or acquired. In none of the authors' cases was there a history of injury or of an inflammatory process preceding the development of symptoms; it was concluded, therefore, that in all cases the stenosis was congenital.

Roen and Stept,[5] in a discussion of urethritis in girls, expressed the belief that urethral stricture predisposes to urethritis with development of periurethral fibrosis, which in turn gives rise to further stricture, bacteria being harbored in the mucosal crypts proximal to the stricture. They also were of the opinion that masturbation might lead to urethritis with the resultant obstructive sequelae, and they suggested that, conversely, the irritation of preexisting urethral disease might be the factor leading to masturbation.

SYMPTOMS

The symptoms of urinary tract infection in children may be varied and usually differ considerably from those commonly observed in adults. Probably the most frequent symptom is sudden, high fever (104° F. or higher) with associated nausea and vomiting. Less commonly does the child complain of flank pain or of mid-urinary tract symptoms such as frequency, urgency or burning. In some cases flank tenderness may be elicited on physical examination. An additional symptom commonly observed by the authors was infrequent urination, at intervals as long as twelve hours or even longer. A second, although less common symptom, was straining on urination without other distress. Other symptoms described are nocturia, and even acute retention.[2]

DIAGNOSIS

The diagnosis of urethral stenosis as the cause of recurrent urinary tract infection is relatively simple:

1. In any child who has repeated urinary tract infection, obstruction of some type should be suspected. Certain simple diagnostic procedures, beyond the basic studies of history, physical examination and urinalysis used to establish the diagnosis of urinary tract infection, should be undertaken. Excretory urograms should be made to determine whether or not there is an obstructive lesion of the upper urinary tract. In conjunction with the excretory studies, the finding that an abnormal amount of the radiopaque medium is retained in the bladder after voiding may be considered fairly good presumptive evidence of lower urinary tract obstruction. This is not an entirely dependable indication, however, since some children when asked to void do not completely empty the bladder, and in some who have only moderate urethral stenosis equivocal amounts of opaque medium are retained.

2. A presumptive diagnosis of urethral stricture having been made, the next step is instrumental examination under anesthesia. The authors believe that a general anesthetic is mandatory for several reasons: The urethra is normally a sensitive organ, and instrumentation in a child may be quite painful. There is great danger of doing serious damage to the urethra by attempting the passage of rigid instruments in a struggling child. An adequate diagnosis requires careful examination and gentle manipulation—obviously impossible without anesthesia. The psychic trauma of painful examinations of the external genitalia and urethra may be of serious consequence in later life.

Campbell[2] said that the urethra of a boy six months old should permit easy passage of a size 14 (French) sound, and that the urethra of a four-

year-old male should admit a size 18 (French). The urethra of girls of corresponding ages, he said, should admit sounds two or three sizes larger. Accordingly, the urethra of a girl of six months should admit size 16 (French) and that of a girl of four years size 20 to 22. It is possible to determine, therefore, by the age of the patient and also by her size (larger children should obviously have relatively larger urethras), what the normal caliber of the urethra should be, and an attempt should be made to pass a sound of corresponding size. If obstruction is met at any point in the urethra, the diagnosis of urethral stenosis is established.

Following passage of sounds, cystoscopy should be done to determine any evidence of obstructive change in the bladder such as trabeculation or sacculation of the walls or hypertrophy of the interureteric ridge. If such changes are present, the child must be watched more closely than one who has urethral stricture without evidence of change in the bladder.

TREATMENT

Before instrumentation of the urethra or bladder is undertaken, an attempt should be made to control any acute urinary infection. In general clinical practice it may not always be feasible to make urine cultures and bacterial sensitivity studies on the urine of a child who has an acute urinary tract infection, but bacteruria may be determined by Gram-staining a centrifuged specimen of urine. The authors have found that a combination of chloramphenicol and sulfisoxazole in adequate doses for a period of six to ten days is usually sufficient for temporary control of most infections.

When the acute manifestations of the disease have subsided, the child should be hospitalized and the urethra calibrated and, if need be, dilated under anesthesia. Cystoscopy should then be performed. One dilatation usually suffices to bring about immediate and gratifying relief of symptoms. In some cases a second dilatation is necessary, but none of the patients treated by the authors required a third. At the time of dilatation and cystoscopy, a culture of the urine should be made. If organisms grow, sensitivity studies should be carried out and the appropriate antibiotic again given.

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REFERENCES

1. Campbell, M. F.: Stenosis of the external urethral meatus, Tr. Am. A. Genito-Urin. Surgeons, 36:183-192, 1944.

2. Campbell, M. F.: Stricture of the urethra in children, J. Pediat., 35:169-179, 1949.

3. Campbell, M. F.: Pediatric Urology, first ed., Macmillan Co., 1937.

4. Hinman, F.: The Principles and Practice of Urology, W. B. Saunders Co., 1935.

5. Roen, P. R., and Stept, R. R.: Inflammation of the urethra in girls, Am. J. Dis. Child., 72:529-535, 1946.

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